CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Mechanical Engineering)**

Semester: **VII**

Course Code: **202090708**

Course Title: **Reliability and Maintenance Engineering**

Course Group: **Professional Elective Course - IV**

Course Objectives: To study and understand the reliability and maintenance in engineering.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	0	3	50 / 18	50 / 17	--	--	100 / 35

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Reliability** Introduction of reliability, Quality control and reliability, need of reliable product, integration of quality and reliability functions, Basic element of reliability, Failure pattern for complex product (Bath tub curve), Achievement of reliability, Cost of reliability, MTBF, MTTR, MTTF, Fault analysis: FMEA	**15**
2	**Maintenance Engineering** Introduction, Growth of maintenance engineering, Purpose of maintenance, Maintenance function, Maintenance level, Maintenance objective and responsibilities, maintenance benefit, maintenance interdependency, Alternate systems to maintenance responsibilities, Maintenance as a discipline. Concept of maintainability , Design for maintainability, Massive over design and de-rating to improve reliability, Maintainability predictions, Maintenance productive enhancement tools (MPET) , Reliability – Availability - Maintainability (RAM)	**11**

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3	**Strategies for Maintenance and Reliability** Basics of selecting maintenance strategies, Reactive maintenance, Corrective maintenance, Opportunistic Maintenance, Routine maintenance, Preventive maintenance, Predictive maintenance, Condition based maintenance system (CBMS), Proactive maintenance, Risk based maintenance, Reliability & maintenance of mechanical components like bearings & gearboxes.	**9**
4	**Maintenance Planning and Control** Maintenance Objective, Basic reason for replacement, Replacement theory: Introduction, Replacement models whose maintenance and repair cost increase with time, Replacement of item that fail suddenly, group replacement theory	**5**
5	**Modern Practices in Maintenance & Reliability** Total Productive Maintenance, Kaizen, Lean Maintenance, six sigma maintenance, 5-Zero maintenance, 5S Concept in Maintenance	**5**
	TOTAL	**45**

Reference Books:

1	Reliability and Maintainability Engineering By Charles E. Ebeling
2	Production & Operation management by R. Panneerselvam (2nd Edition), PHI
3	Industrial Engineering & Production management By M. S. Mahajan
4	Reliability engineering & maintenance management by Dr. Bikas Bhadury & Dr. S.K.Basu
5	Maintenance engineering by Er. Shushil kumar Shrivastava
6	Statistical quality control by M.Mahajan

Supplementary learning Material:	
1	NPTEL resources

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

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Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
20%	15%	15%	20%	25%	5%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To understand the basic of reliability engineering	**33**
CO-2	To understand maintenance and its importance in engineering	**24**
CO-3	To understand strategy for maintenance and reliability and maintenance planning control	**31**
CO-4	To understand modern practices in maintenance & reliability	**12**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	--
Next Review on (Month-Year):	June-2025

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